Course code: ……. **Plan position:** ……

A. INFORMATION ABOUT THE COURSE

B. Basic information

Name of course	Plant Biotechnology
Field of studies	Biotechnology/Agriculture
Level of studies	I (engineer) or II (master)
Profile of studies	general academic
Form of studies	stationary
Specialty	
Unit responsible for the field of studies	Faculty of Agriculture and Biotechnology, Laboratory of Ornamental Plants and Vegetable Crops
Name and academic degree of teacher(s)	Assoc. Prof. Dariusz Kulus, dr Natalia Miler, dr Alicja Tymoszuk
Introductory courses	none
Introductory requirements	no requirements

C. Semester/week schedule of classes

Semester	Lectures (W)	Auditorium classes (Ć)	Laboratory classes (L)	Project classes (P)	Seminar (S)	Field classes (T)	Number of ECTS points
	14		21				7

2. LEARNING OUTCOME

No.	Learning outcomes description	The reference to the learning outcomes of specific field of study	The reference to the learning outcomes for the area
KNOWLEDGE			
W1	Student understands the relationship between the achievements of biotechnology in plant production and the possibilities of their use in socio-economic life, taking into account the sustainable use of biodiversity	K_W17	P6S_WG
W2	Student knows biotechnological methods used in the commercial application of plant tissue cultures for the propagation and breeding of plants	K_W16	P6S_WG
SKILLS			
U1	Student is able to plan the course of plant production *in vitro* and evaluate the benefits of using proper methods in commercial propagation and plant breeding	K_U17	P6S_UW
U2	Student is able to perform all stages of micropropagation for various groups of plants, uses biotechnological methods	K_U15	P6S_UW

	in the protection of genetic resources and in demonstrating the distinctiveness of cultivars		
U3	Student knows how to operate the equipment used in a tissue culture laboratory and molecular biology laboratory	K_U13	P6S_UW
SOCIAL COMPETENCES			
K1	Student uses the laboratory equipment correctly, taking care of his own and others' safety and is responsible for the devices entrusted to him	K_K07	P6S_KR

3. TEACHING METHODS

A. Traditional methods used ***

multimedia lecture, laboratory exercises

B. Distance learning methods used ***

~~**Synchronous method** (classes conducted in a way that ensures direct interaction between the student and the teacher in real time, enabling immediate flow of information, the method can be used only if it is provided for in the study plan for a given cycle of education):~~
~~e.g. remote lecture in the form of videoconference, remote discussion, etc.~~

~~**Asynchronous method** used as an auxiliary (a method that does not ensure direct interaction between the student and the teacher in real time, used only as an auxiliary / complementary method)~~
~~e.g. online educational videos, online multimedia presentations, etc.~~

4. METHODS OF EXAMINATION

Lectures:
form of examination: final written exam
pass conditions: W1, W2 - obtaining on the final exam at least 51% of points confirming the achievement of the learning outcomes listed in paragraph 2

Laboratory classes:
form of examination:
- one test
- final evaluation of observation cards and reports
- presence required (possibility to miss one meeting without excuse)

pass conditions:
test:
W1, W2; obtaining at least 51% of points confirming the achievement of each of the learning outcomes
Observation cards and reports:
U1 and U2; obtaining at least 51% of points confirming the achievement of each of the learning outcomes
Components of the final evaluation of laboratory classes:
Test: 0.7, observation cards and reports: 0.3.

Components of the final grade: from the Study Regulations:
grading scale depending on the level of achievement of learning outcomes (given as a percentage):
a) from 91% very good (5.0);
b) from 81% good plus (4.5);
c) from 71% good (4.0);
d) from 61% satisfactory plus (3.5);
e) from 51% satisfactory (3.0);

f) below 51% unsatisfactory (2.0).

final grade based on partial grades (lectures and laboratory classes):
a) from 4.76 very good (5.0);
b) from 4.26 good plus (4.5);
c) from 3.76 good (4.0);
d) from 3.26 satisfactory plus (3.5);
e) from 3.00 satisfactory (3.0);
f) below 3.00 unsatisfactory (2.0).

5. SCOPE

Lectures	*In vitro* cultures in plant production. Contaminations in *in vitro* cultures – methods of identification and elimination. The organization and isolation of meristems. Somaclonal variation. Cloning of orchids. Micropropagation of lilies. Somatic embryogenesis. Application of artificial seeds in horticulture. Bioreactors for plant tissue cultures. The preservation of genetic resources worldwide. Cryopreservation of plant tissues. Creation of new cultivars. Application of biotechnology in mutagenic breeding. Separation of chimera components. Identification of cultivars using modern methods of molecular biology.
Laboratories	The layout and equipment of the plant tissue culture laboratory. Media for micropropagation of selected horticultural crops. Stages of micropropagation. The analysis of conditions important for the acclimatization of plants in a glasshouse. Modern techniques of producing high-quality plant material *in vitro* (chrysanthemum, streptocarpus, gerbera, dicentra, etc). Single-node method, axillary buds method, adventitious buds method, somatic embryogenesis. Micropropagation of vegetable crops and woody plants. Application of molecular markers in ornamental plant breeding.

6. METHODS OF VERIFICATION OF LEARNING OUTCOMES

LEARNING OUTCOME	Form of assessment		
	Written exam	Written test	Observation cards and reports
W1	x		
W2	x		
U1		x	x
U2		x	x
U3			x
K1			x

7. LITERATURE

Basic literature	In vitro cultures of higher plants R.L.M. Pierik, Martinus Nijhoff Publishers, 1987. Micropropagation: technology and application P.C. Debergh, R.H. Zimmerman, Kluwer Academic Publishers, 1991. Dictionary of plant tissue culture" A.C.Cassels, P.B.Gahan, Food Products Press, 2006.
Supplementary literature	BioTechnology, Journal of Biotechnology, Computational Biology and Bionanotechnology, Plant Cell Tissue and Organ Culture.

8. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

Student’s activity		Student workload– number of hours
Classes conducted under a direct supervision of an academic teacher or other persons responsible for classes	Participation in classes indicated in point 1B	35
	Supervision hours	5
Student's own work	Preparation for classes	50
	Reading assignments	50
	Other (preparation for exams, tests, carrying out a project etc)	35
Total student workload		175
	Number of ECTS points	7